

CLAIMS

1. A twisting machine comprising: a spindle (1) to which a thread or a plurality of threads (70) is/are introduced in use and from which the thread or the plurality of threads (70) is/are taken out in use, the spindle (1) being driven by a spindle driving motor (27); a rotor (12) being associated with the spindle (1) and being in contact with the thread or plurality of threads (70) taken out of the spindle (1) while rotating in use; a winding drum (46) for winding the thread or the plurality of threads (70), which advance from the rotor (12) and are conveyed via a thread guide (43), onto a bobbin (45) in use; and a stationary carrier (13) carrying the bobbin (45), characterized in that the machine comprises means for independently moving the spindle (1) and winding drum (46).
2. A machine according to claim 1, characterized in that a first power transmission means (10) is coaxially mounted to the spindle (1), said first power transmission means (10) being moved independently from the spindle (1).
3. A machine according to claim 2, characterized in that a primary planetary element (6) is provided, said primary planetary element (6) performing planetary rotation around the spindle (1) axis by the motion provided by the first power transmission means (10).
4. A machine according to claim 3, characterized in that a spindle element (21) engaged to the primary planetary element (6) is provided for transmitting the motion of the primary planetary element (6).
5. A machine according to claim 4, characterized in that a secondary planetary element (8) is engaged to the spindle element (21), said secondary planetary element (8) performing planetary rotation around the spindle (1) axis.

6. A machine according to claim 5, characterized in that a second power transmission means (17) is coaxially mounted to the spindle (1), said second power transmission means (17) being moved independently from the spindle (1) and wherein said secondary planetary element (8) transmits its motion to said second power transmission means (17).
7. A machine according to claim 6, characterized in that a driving pulley (15) is provided for driving the winding drum, said driving pulley (15) being associated with the second power transmission means (17).
8. A machine according to claim 7, characterized in that a winding bobbin pulley (51) is provided to the winding means for transmitting the motion of the driving pulley (15) to the winding means, and in that a driving belt (40) is provided to the driving pulley (15) and to the winding bobbin pulley (51).
9. A machine according to claim 6, characterized in that a yarn feeder pulley (14) is provided for driving a yarn feeder spindle (41) associated with the second power transmission means (17).
10. A machine according to claim 9, characterized in that a yarn feeder spindle pulley (48) is mounted to the yarn feeder spindle (41) for transmitting the motion of the yarn feeder pulley (14) to the yarn feeder spindle (41) having a yarn feeder roller (49), and in that a driving belt (39) is provided to the yarn feeder pulley (14) and to the yarn feeder spindle pulley (48).
11. A machine according to claim 10, characterized in that a waxing element (50) is provided for waxing a thread passed through the yarn feeder roller (49).
12. A machine according to claim 11, characterized in that a waxing driving belt (57) is provided between the waxing element (50) and the yarn feeder spindle (41) for driving the waxing element (50) by the yarn feeder spindle (41).

13. A machine according to claim 2, characterized in that a driving motor (28) is provided for driving the first power transmission means (10), said driving motor (28) being independently operated from the spindle driving motor (27).
- 5 14. A machine according to claim 13, characterized in that a first collar (33) is mounted to the first power transmission means (10).
15. A machine according to claim 14, characterized in that a planetary pulley mechanism (4) is fixed to the first collar (33) and said planetary pulley mechanism (4) is driven by the driving motor (28).
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16. A machine according to any of claims 6 to 15, characterized in that a second collar (38) is mounted to the second power transmission means (17).
- 15 17. A machine according to anyone of claims 4 to 16, characterized in that a bearing housing (23) is provided for bearing the spindle element (21) to the rotor (12) and to a rotor lower piece (11) mounted to the underside of the rotor (12).
- 20 18. A machine according to claim 17, characterized in that bearings are provided inside the bearing housing (23) for mounting the spindle element (21) and in that lids (54) are provided on the bearing housing (23) for preventing lubricant leakage therefrom.
- 25 19. A machine according to anyone of claims 5 to 18, characterized in that said primary planetary element (6), said spindle element (21) and said secondary planetary element (8) are capable of rotating about the spindle (1) axis and about their own axes.
- 30 20. A machine according to claim 6, characterized in that said first power transmission means (10), said second power transmission means (17), said primary planetary element (6) and said secondary planetary element (8) are

selected from the group consisting of gear, pulley, pulley gear, magnetic gear and chain gear.

5 **21.** A machine according to any of claims 3 to 20, characterized in that motion transmission from the first power transmission means (10) to the primary planetary element (6) is performed by the means selected from the group consisting of trigger belt, chain, gear and magnetic means.

10 **22.** A machine according to any of claims 5 to 21, characterized in that motion transmission from the secondary planetary element (8) to the second power transmission means (17) is performed by the means selected from the group consisting of trigger belt, chain, gear and magnetic means.

15 **23.** A machine according to claim 1, characterized in that: a first power transmission means (10) is coaxially provided to the spindle (1), said first power transmission means (10) being driven independently from the motion of the spindle (1); in that at least one planetary element (6) is substantially perpendicularly provided to the spindle (1) axis, the planetary element (6) being driven by the first power transmission means (10) for rotating; and in
20 that a second power transmission means (17) is coaxially provided to the spindle (1) and said second power transmission means (17) being driven by the planetary element (6).

25 **24.** A machine according to any preceding claim, characterized in that in use, one or more threads are fed through the thread guide head (43) to be covered by the thread or threads (70) advancing from the rotor (12).

30 **25.** A machine according to anyone of the preceding claims, characterized in that a sensor device is provided for terminating winding of the threads onto the bobbin (45) when the thickness of the bobbin (45) increases to a predetermined level.

26. A machine according to claim 25, characterized in that the sensor device comprises a signal supplier (63) and a signal receiver (64) so that in use when the thickness of the bobbin (45) increases to a predetermined value, the signal between the supplier (63) and the receiver (64) is interrupted and the winding is terminated.

27. A machine according to claim 25, characterized in that the sensor device comprises a switch (59) capable of contacting with an end of a bobbin arm (58) fixing the bobbin (45) to the carrier (13); a radio signal generator (61) driven by the switch (59); and a receiver (62) so that in use when the thickness of the bobbin (45) increases to a predetermined level, the bobbin arm (58) drives the switch (59) for generating a radio signal to be received by the receiver (62) for terminating winding.

28. A machine according to claim 25, characterized in that the sensor device comprises a reflector (66) mounted to the end of the bobbin arm (58); a beam supplier-receiver (68) for supplying the beam (67) to and receiving the beam from the reflector (66) so that when the thickness of the bobbin (45) increases to a predetermined level, the bobbin arm (58) and the reflector (66) rotate and the reflected beam (67) is received by the beam supplier-receiver (68) for terminating winding.

29. A machine according to anyone of the preceding claims, characterized in that a first stationary element (9) is coaxially mounted to the first collar (33) and said first stationary element (9) is immovably mounted to a fixing platform (26) fixed to the body of the machine.

30. A machine according to anyone of the preceding claims, characterized in that a secondary planetary spindle (20) for performing planetary rotation around the spindle (1) axis is provided, said secondary planetary spindle (20) being associated with the rotor (12) and being rotatable by the motion of the rotor (12).

31. A machine according to claim 30, characterized in that a tertiary planetary element (5) is provided at an end of the secondary planetary spindle (20), said tertiary planetary element (5) performing planetary rotation around the spindle (1) axis.

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32. A machine according to claim 31, characterized in that a quaternary planetary element (7) is provided at the other end of the secondary planetary spindle (20).

10 **33.** A machine according to any of claims 16 to 32, characterized in that a second stationary element (16) is coaxially mounted to the second collar (38).

15 **34.** A machine according to claim 32, characterized in that the quaternary planetary element (7) performs planetary rotation around the spindle (1) axis.

35. A machine according to claim 32, characterized in that the tertiary planetary element (5) and the quaternary planetary element (7) are rotatable about the secondary planetary spindle (20) and rotatable about the spindle (1) axis.

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36. A machine according to claim 33, characterized in that said stationary carrier (13) is fixed to the second stationary element (16).

25 **37.** A machine according to claim 33, characterized in that the first stationary element (9), the second stationary element (16), the tertiary planetary element (5) and the quaternary planetary element (7) are selected from the group consisting of gear, pulley, magnetic gear and chain gear.

30 **38.** A machine according to claim 33 or 37, characterized in that teeth are provided on the first and second stationary elements and in that the number of teeth of the first stationary element (9) and the number of teeth of the second stationary element (9) are equal or unequal.

39. A twisting machine comprising: a spindle (1) to which a thread or a plurality of threads (70) is/are introduced in use and from which the thread or the plurality of threads (70) is/are taken out in use, the spindle (1) being driven by a spindle driving motor (27); a rotor (12) being associated with the spindle (1) and being in contact with the thread or plurality of threads (70) taken out of the spindle (1) while rotating in use; a winding drum (46) for winding the thread or the plurality of threads (70) which advance from the rotor (12) and are conveyed via a thread guide (43), onto a bobbin (45) in use; and a stationary carrier (13) carrying the bobbin (45), characterized by comprising a first power transmission means (10) coaxially mounted to the spindle (1) axis and being moved in use independently from the motion of the spindle (1); a primary planetary element (6) being drivable by the motion of the first power transmission means (10) and performing planetary rotation about the spindle (1) axis in use; a spindle element (21) engaged with the primary planetary element (6) for transmitting the motion thereof; a secondary planetary element (8) engaged to the spindle element (21), said secondary planetary element (8) performing planetary rotation about the spindle (1) axis in use ; an upper power transmission means (17) coaxially mounted to the spindle (1) axis and being drivable by the secondary planetary element (8).
40. A machine according to the claim 39, characterized by comprising: a first stationary element (9) mounted coaxially to a first collar (33), said first collar being mounted coaxially to the spindle (1) axis, and said first stationary element (9) being fixed to a fixing platform (26) fixed to the machine body; a secondary spindle element (20) associated with the rotor (12) and performing planetary rotation about the spindle (1) axis by the motion of the rotor (12) in use; a tertiary planetary element (5) mounted to an end of the secondary spindle element (20), said tertiary planetary element (5) performing planetary rotation about the spindle (1) axis; a quaternary planetary element (7) mounted to the other end of the secondary spindle element (20); and a second stationary element (16) the carrier being fixed thereto and being mounted coaxially to a second collar (38) mounted coaxially to the spindle (1).

41. A machine according to claim 11, characterized in that the twisted thread passed through the waxing element (50) is directed to the winding drum (46) through an opening 47 grooved on an upper table 56 without employing any other directing means.

42. A method for twisting threads comprising: introducing a thread or plurality of threads into a spindle (1) having an aperture (15) extending along the axis thereof, said spindle (1) being driven by a motor (27); taking out the twisted thread or the plurality of threads from the spindle and advancing the threads from the outer surface of a rotor (12); and further advancing the twisted threads to a winding drum (46) for winding the twisted threads onto a bobbin (45), characterized in that the method comprises the steps of;

- transmitting the movement of a secondary motor (28) to a primary power transmission means (10) rotatable independently from the spindle (1), said primary power transmission means (10) being arranged coaxially with the spindle (1),
- transmitting the movement provided by the primary power transmission means (10) to a secondary power transmission means (6) capable of performing planetary movement with respect to the spindle (1) axis,
- transmitting the movement provided by the secondary power transmission means (6) to a tertiary power transmission means (17) rotatable independently from the spindle (1) and said tertiary power transmission means (17) being arranged coaxially with the spindle (1).

43. A twisting machine comprising:

a spindle (1) extending in an axial direction from a first end to a second end thereof;

drive means for rotatably driving the spindle (1);

a rotor (12) coaxially mounted to the spindle adjacent the second end thereof;

winding means for winding thread onto a bobbin (45);

a stationary carrier (13) supported over the rotor on the opposite side thereof from the spindle, the carrier supporting the bobbin thereon; and

thread guide means (43) spaced in the axial direction from the carrier,

wherein in use, thread (70) extends from the spindle via the radially outer edge of the rotor to the thread guide means, characterized in that the machine comprises means for independently moving the spindle and the winding means.

44. A twisting machine as claimed in claim 43, wherein the means for independently moving the spindle (1) and the winding means comprise:

a first gear (10) mounted coaxially with the spindle to be located externally of the extent of the thread in use, said first gear being driven by further drive means (28) independently operated from the spindle driving means (27);

a second gear (17) mounted coaxially with the spindle, said second gear being axially spaced from the first gear to be located internally of the extent of the thread in use; and

a further gear mechanism for transferring the drive from the first gear to the second gear in use.

45. A twisting machine as claimed in claim 44, wherein the further gear mechanism comprises:

a primary planetary element (6) for being driven by the first gear (10) to perform planetary motion about the spindle (1) axis;

a spindle element extending in the axial direction from the primary planetary element; and

a secondary planetary element (8) attached to the spindle element and axially spaced from the primary planetary element, wherein the secondary planetary element is driven by the primary planetary element and the spindle element to perform planetary motion about the spindle axis and so drives the second gear (17) in use.

46. A twisting machine as claimed in claim 44, wherein the further gear mechanism comprises:

a planetary element (6) extending substantially perpendicular to the first (10) and second (17) gears and engaging therewith.

47. A method of twisting a plurality of threads using the apparatus as claimed in
5 any of claims 43 to 46, the method comprising:

supplying a plurality of threads (70) to the first end of the spindle (1) such
that the threads are twisted by the spindle in use; and
winding the twisted threads on the bobbin (45).

10 48. A method of covering a thread using the apparatus as claimed in any of
claims 43 to 46, the method comprising:

supplying a thread (70) to the first end of the spindle (1);
supplying one or more threads directly to the thread guide means (43) such
that the thread from the spindle is wrapped around the threads supplied directly to
15 the guide means in use; and
winding the covered threads on the bobbin (45).